Environmental Assessment
of the
Strategic Energy Assessment 2006-2012
Docket 05-ES-103

Purpose of the environmental assessment

This is the environmental assessment (EA) of the 2006 Strategic Energy Assessment (SEA), which covers the period 2006-2012. The purpose of this EA is to discuss generic issues presented in the SEA and describe their potential environmental impacts as required by Wis. Stat. § 196.491(2)(f). The SEA evaluates the adequacy and reliability of the state's current and future electrical supply (Wis. Stat. § 196.491(2)(a)).

SUMMARY

For the years 2006 through 2012, the utilities have proposed construction of additional base-load generation, large wind facilities, and new transmission lines. The potential impacts of these projects draw attention to the following topics:

- New technologies and the use of the latest pollution control measures could significantly reduce air emission impacts from all types of power plants especially when compared to emission levels from older plants.
- To reduce environmental and community impacts from the operation of more power plants, Wisconsin should implement all programs and incentives for increasing energy efficiency, energy conservation, and the use of renewable sources of electricity.
- The uncertainty regarding air emission regulations is delaying the installation of pollution control facilities on existing power plants. Delaying needed air emission reductions from some of the state's most polluting power plants may cause the state to miss meeting regulatory deadlines when they are finalized.
- Construction and upgrade of transmission lines will continue to cause environmental and community impacts. Re-use of existing electric facility corridors, as well as corridor-sharing with roads and railroads where appropriate can reduce environmental impacts.
- State requirements for renewable energy sources and the renewal of federal tax credits will increase construction of wind farms in Wisconsin and outside of the state. Properly sited wind farms could help reduce environmental pollution and slow the construction of fossil-fueled power plants to meet peak electrical demand. The potential cumulative impacts of numerous wind turbines along the Niagara Escarpment should be adequately studied. The purchase of renewable energy sources from Minnesota or Iowa may require construction of new high-voltage transmission lines.
- Public involvement in all phases of electric construction projects is invaluable in determining good routing options and balancing the trade-offs of potential impacts.

The 2006 Strategic Energy Assessment identifies, describes, and assesses different aspects of Wisconsin's electric picture for the next seven years. This environmental assessment (EA) of the SEA discusses the potential environmental effects of the issues contained in the SEA. This environmental assessment was prepared under Wis. Stat. 196.491(2)(f).

Kathleen J. Zuelsdorff
WEPA Coordinator,
Public Service Commission of Wisconsin

June 8, 2006
Date

1.0 The draft SEA

The draft SEA was published in June 2006. Information for the Draft SEA and this Environmental Assessment came from historic and forecasted information submitted by utility electricity and transmission providers. The utilities that submitted generation information included: Madison Gas and Electric Company (MGE); Manitowoc Public Utility (MPU), Northern States Power-Wisconsin (NSPW), Superior Water, Light and Power Company (SWL&P), Wisconsin Electric Power Company (WEPCO), Wisconsin Power and Light Company (WP&L), and Wisconsin Public Service Corporation (WPSC). Data was also provided by Dairyland Power Cooperative (DPC) and Wisconsin Public Power, Inc. (WPPI) on behalf of their member cooperatives and municipal utilities. Transmission data was provided by American Transmission Company, LLC (ATC), DPC, and NSPW. While this SEA does not include any information from non-utility companies, it does provide a view of the industry's future and its potential impacts in Wisconsin.

2.0 Generation

2.1 Load Growth

In 2005, peak monthly electric demand ranged from 9,610 MW in April to 14,323 MW in July. Demand for electricity is typically higher in the summer; lowest in the spring and autumn "shoulder" months, with a smaller peak in the winter. This pattern of summer and winter peaks is expected to continue into the future. The peak monthly demand in 2012 is forecasted at 17,144 MW, resulting in an average annual growth rate of about 2.0 percent per year. This is comparable to the peak demand growth rates estimated in previous SEAs. Load growth is growing at a faster rate than the state's population, which for the past 15 years has averaged 0.9 percent per year.

Utilities can control peak load through either direct load control or interruptible load. Direct load management gives the utility the ability to turn off specific residential appliances such as air conditioners. Customers volunteer to participate in the program. Interruptible load involves industrial customers who agree to allow their electricity to be interrupted during periods of peak demand in return for a lower electric rate. The combined load reduction effects of these programs have, for the past 10 years, ranged from a low of 389 MW in 2004 to an all time high of 956 in 1998. In 2005, reductions from these programs dipped to 423 MW, but they are expected to double to 821 MW in 2006. For the period from 2006 to 2012, the programs are expected to grow about 0.7 percent per year. As electrical demand continues to grow, forecasts indicate that reductions from peak load control programs will continue to amount to a smaller percentage of the total electric power supply.

2.2 Capacity

From 2000 to 2005, Wisconsin's total electric power supply increased approximately 5 percent per year. In 2005, the state's power supply was 17,040 MW, up 3.1 percent from 2004. The power supply is projected to continue to increase through 2012 at a rate of about 1.6 percent per year.

Wisconsin is in a multi-year expansion period for electric generation. In 2005, approximately 1,300 MW of new generation capacity became commercially operational. Between 2006 and 2012, additional construction could increase in-state generation capacity by more than 3,000 additional MW.

Facilities currently under construction include three new large coal-fired units with over 1,700 MW of capacity. These are the first new, coal-fired baseload plants in Wisconsin since the early 1980s. Over 400 MW of new wind-powered generation are expected to become part of the Wisconsin generation mix between 2006 and 2007. Over 500 MW of natural gas combined-cycle capacity is expected along with 55 MW from a boiler firing petroleum coke and 100 MW of additional generation from an upgrade of a nuclear power plant. Table 1 identifies the new plants under construction and currently under consideration by the utilities.

Table 1: New Utility-Owned or Leased Generation Capacity (2005-2012)

Year	Owner	Project	Fuel	County	Capacity (MW)
2005	WEPCO	Port Washington North Combined Cycle	Natural Gas	Ozaukee	545
2005	WP&L	Sheboygan Combustion Turbine	Natural Gas	Sheboygan	300
2005	MGE Power, LLC.	West Campus Cogeneration Facility	Natural Gas	Dane	150
2005	Calpine	Fox Energy Combined Cycle	Natural Gas	Outagamie	300
2006	Calpine	Fox Energy Combined Cycle	Natural Gas	Outagamie	240
2006	Manitowoc	Fluidized Bed Boiler	Coke	Manitowoc	58
2006	Invenergy	Forward	Wind	Dodge / Fond du Lac	200
2007	WEPCO	Blue Sky / Green Field	Wind	Fond du Lac	203
2007	WEPCO	Port Washington Combined Cycle	Natural Gas	Ozaukee	545
2007	WP&L	Cedar Ridge Wind Farm	TBD	TBD	98*
2008	WPSC	Weston SCPC Unit 4	Coal	Marathon	515
2009	WEPCO	Elm Road SCPC Unit 1	Coal	Milwaukee	615
2010	WEPCO	Elm Road SCPC Unit 2	Coal	Milwaukee	615
2010	WPPI	Prairie State	Coal	Southern Illinois	50
2011	WEPCO	Point Beach 1 and 2 Upgrade	Nuclear	Kewaunee	100
2012	WP&L	Baseload plant	Coal	Grant or Portage	250
TBD**	WPSC	Baseload plant	Coal	Marathon or Portage	TBD
				Total Potential Additional Capacity	**4,784**

TBD = to be determined.
*WP&L is undecided whether this will be owned or purchased.
** Construction may begin before 2012

Plans include few retirements or downgrades of plants currently operating in Wisconsin. In 2004, WEPCO retired three of its older Port Washington coal-burning units with a total capacity of 225 MW. MG&E plans to eliminate all coal burning facilities at its Blount Generating Station in Madison reducing the power plant's capacity by 90 MW. Due to the uncertainty of future pollution regulations, the utilities are hesitant to specify which older plants will be retired or upgraded to meet the potential lower pollution requirements. However, it is reasonable to assume that some additional older units will be retired prior to 2012. Appendix Table A-3 contains a list of the communities where power plant construction is anticipated.

Though the projections are of continued growth in peak demand, the proposed new generation is expected to keep planning reserve margins near or above 18 percent through 2012.

2.3 Types of Generation

Almost 80 percent of Wisconsin electricity is generated by coal-burning and nuclear power plants. On a percentage basis, Wisconsin relies more on coal-fired generation as an electric energy source than Minnesota, Illinois, or the U.S.

There is a significant difference between capacity (Figure 1) and electric energy consumed (Figure 2). While the state's capacity may show significantly more MW of lower polluting power plants, the energy consumed indicates the true environmental impacts of our generation mix. For example, 44.6 percent of Wisconsin's capacity is from coal-burning plants, however more than 60 percent of actual electric energy consumed is generated by coal plants. Similarly, Wisconsin has a 38 percent generation capacity from natural gas but only 2.8 percent of the fuel mix is energy consumed from natural gas-burning plants. While natural gas is far less polluting than coal, natural gas plants are primarily peaker plants and operate a significantly smaller percentage of the time. Because electrical demand varies from hour to hour over the course of a day and from season to season, Wisconsin requires a mix of baseload, intermediate, and peaking power plants to reliably fulfill the continuous energy demands of the state year-round.

Figure 1: July 2006 Electric Capacity by Fuel Type – Summer Rating, MW[1]

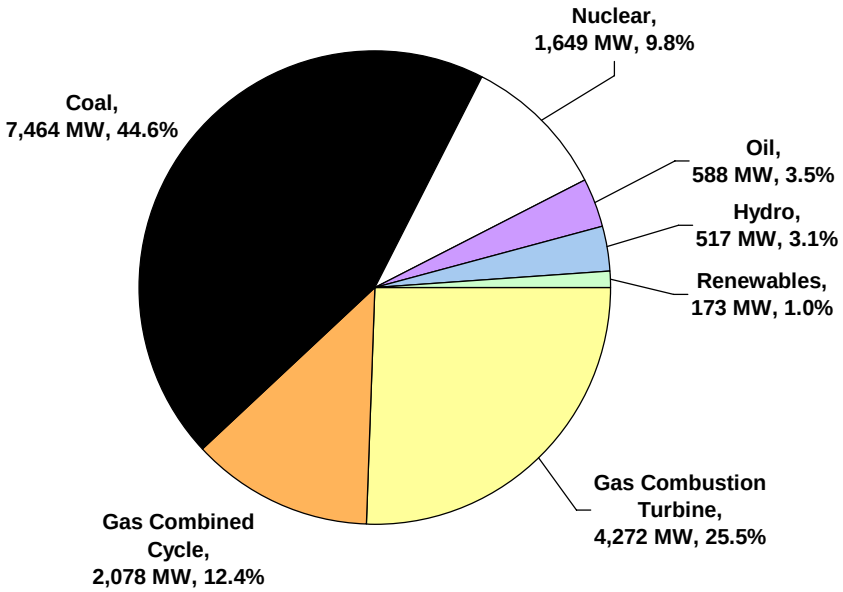
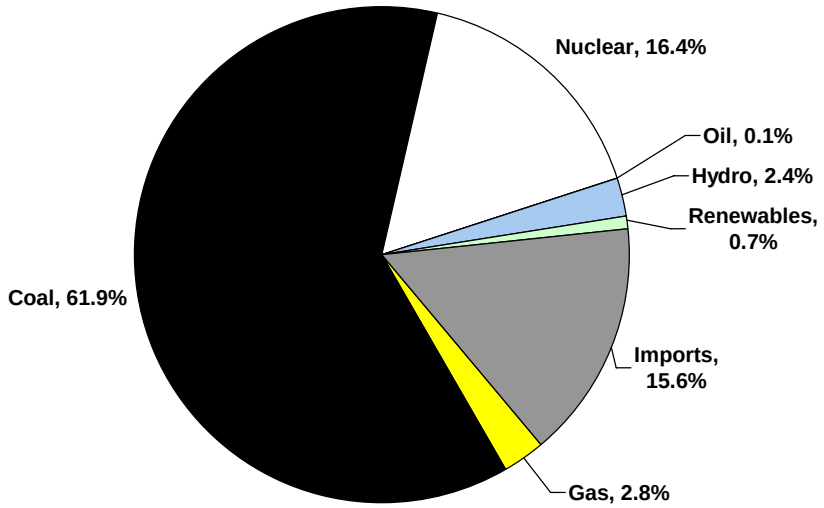


Figure 2: Electric Generation by Fuel for 2004, MWh



[1] Chart includes the Presque Isle Power Plant located in the Upper Peninsula of Michigan. Northern States Power and WPPI generation located in Minnesota is not included.

2.3.1 Generation plants that use coal

Coal-burning plants are base load plants and operate continuously 70 to 80 percent of the time. Coal is inexpensive compared to natural gas but releases higher levels of sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon dioxide (CO_2), particulate matter (PM), and mercury (Hg) into the air. More than 95 percent of the pollutants emitted by power plants are emitted by coal-fired plants. Figures 3-6 show a comparison of the pollution emitted by plants powered by various fuels. Environmental concerns surrounding the use of coal to produce energy include global warming, acid rain, bioaccumulation of mercury in eating fish, and regional and local health issues. In addition to the air emissions, most coal plants have significant community impacts due to the transport and handling of coal (roads, trains, and barges), the disposal of ash wastes, and the need for large quantities of cooling water.

2.3.1.1 Older coal plants

In Wisconsin, most existing coal plants use pulverized coal technologies. While coal plants currently under construction will produce less pollution than older coal plants, Wisconsin still has in operation a number of very old, small coal-fired boilers that were built prior to 1960. Over 5,000 MWh of electricity is generated by these units amounting to approximately 8 percent of the total electricity consumed. These units are not very efficient and emit a disproportionate amount of pollution compared to other power plants. Despite their small name plate capacities, they are run as baseload units and often generate more energy than would be generated by a new natural gas combustion turbine. Before 2012, it is very likely that some older coal-fired units will be retired rather than modified with newer pollution control devices.

2.3.1.2 SCPC technology

Recently approved plants, now under construction (WEPCO Elm Road Units and WPSC Weston 4), will use the newer coal technology of supercritical pulverized coal (SCPC). This technology uses higher temperatures and pressures which improves the plant's efficiency. Greater plant efficiency means less fuel burned per unit of electrical output, which in turn decreases environmental impacts. Compared to the currently operating, older coal plants, SCPC plants produce less air emissions (see Figures 3-6). While the newly-approved Elm Road and Weston 4 units are both SCPC technology, only the ash wastes from Elm Road units can be reused in construction. The fly ash from the Weston 4 will most likely be too contaminated with sulfur and mercury to be reused and will therefore need to be disposed of in a landfill.

2.3.1.3 IGCC technology

Another type of coal plant is the Integrated Gasification Combined Cycle (IGCC) plant. Only two IGCC plants operate in the US today; both are smaller than the baseload plants currently under construction. The coal gasification process of the IGCC allows pollutants to be more easily captured for beneficial reuse. For instance over 99 percent of sulfur can be captured as elemental sulfur or as sulfuric acid and sold. Additionally, the plant can more easily be set up to capture mercury, hydrogen, and carbon dioxide. Over 90 percent of mercury can be removed by absorption in a special activated carbon bed. The solid waste from IGCC units are a marketable, dustless, vitreous slag instead of ash. This inert slag can be fully used in construction and construction materials. Additionally, IGCC plants use less water than SCPC units.

SCPC facilities (and ultra-SCPC technologies) have the potential of reaching higher efficiency levels than older pulverized coal technologies, thus releasing fewer pollutants for every ton of coal consumed. However, IGCC air pollution emissions can be somewhat lower than those of SCPC units. Nitrogen oxide emissions would be lower and the use of selective catalytic reduction would reduce them further. Emissions of particulates, carbon monoxide, sulfur, and volatile organic compounds would also be greatly reduced. Attracting a great deal of attention at this time is the relatively favorable potential for IGCC plants to capture carbon dioxide for sequestration, a potential advantage if federal carbon taxes or similar programs to combat global warming are implemented.

The main reasons why IGCC plants have not proliferated across the country is that IGCC technology is more expensive at this time than similarly sized SCPC plants and early IGCC plants have experienced reliability and availability problems. New state and federal rules will require lower emissions of pollutants. Updating older more-polluting coal plants with emission control facilities and/or participating in the proposed cap and trade programs will make these plants more expensive to operate. This combined with new federal incentives may make IGCC plants an attractive replacement alternative to existing older "dirty" coal plants. Currently a few new IGCC plants are about to undergo front end engineering studies in preparation for more advanced permitting and certification processes. As the technology becomes more proven, the environmental benefits from IGCC technology may become a feasible power plant technology in Wisconsin. The Commission is continuing to monitor advancements in this technology.

2.3.2 Generation plants that use natural gas

There are two main types of natural gas power plants, combustion turbine and combined cycle. Combustion turbine plants have relatively low construction costs but are more expensive to operate. Their efficiency is typically low, approximately 26 percent. Continued improvements in this technology have raised their efficiency to approximately 36 percent. Combustion turbines are commonly constructed as peak load plants and used only during periods of peak demand such as in the summer, when cooling appliances require high amounts of energy very quickly. Combustion turbines operate approximately 5 to 10 percent of the time. Air pollution from this technology includes nitrogen oxides, carbon monoxide, and carbon dioxide.

Combined cycle plants are more efficient than combustion turbines because the rejected heated gases of a combustion turbine are not vented into the air but instead are used to produce steam for a second electric generator. Combined cycle plants can be designed to convert 50 to 55 percent of the fuel energy into electrical energy. Construction and operating costs are between those of coal plants and those of combustion turbines. These plants are commonly used as intermediate load plants, operating between 25 percent of the time to perhaps 70 percent of the time. Combined cycle plants produce less nitrogen oxides and carbon dioxide emissions than a combustion turbine plant.

Natural gas-fired power plants have little difficulty meeting current standards for emission of air pollutants. For these plants, the potential environmental impacts of most concern are the effects of land use compatibility and the impacts related to the associated facilities, such as water intake/discharge structures, water lines, electric transmission lines, and natural gas pipelines. In addition, depending on the plant location, concerns may include noise, vibrations, traffic, and

visual impacts close to the plant site. People living near proposed natural gas-fired power plant sites are often concerned about negative effects on their property values, due to noise levels and plant site aesthetics.

2.3.3 Cogeneration plants

Cogeneration plants can use a variety of fuels. These plants produce electricity as well as steam for heat, cooling, or processing. Natural gas cogeneration plants can be very efficient, up to 70 percent. These efficiencies reduce total fossil fuel consumption and in turn, reduce the emissions released to the atmosphere. Overall emissions are dependent on the fuel source and the type of emission controls in place at each facility. There are only two cogeneration facilities in the state. Two coal-burning units in Milwaukee produce approximately 280 MW (Valley Power Plant) and a new 150 MW natural gas cogeneration plant was recently constructed in Madison (West Campus Cogeneration Facility).

2.3.4 Generation plants that use fuel oil

Air pollutant emissions from internal combustion (IC) engines, in particular diesel generators, are a concern, due to their increased use as back-up power and transmission system reliability. IC engine generators range in size from small units that do not require air permits to very large units that may need to meet emission standards. Diesel fuel is also used as a primary or back up fuel to fire combustion turbines, combined cycle units, and coal and natural gas-fired boilers. Most of the diesel fuel used to generate electricity is used in these facilities. A relatively small amount of electrical power in Wisconsin is produced by IC engines. These, mostly smaller plants, have efficiency levels that are comparable to older coal plants. Air pollutant emissions are typically higher per unit of electricity produced.

Electrical generation from internal combustion engines produces as much or more carbon dioxide, nitrogen oxides, sulfur dioxide, and particulate emissions per megawatt-hour of electricity produced as coal technologies. The use of diesel-fired power plants is increasing, because they are an economic choice for distributed generation (small units located near users), peak generation, and emergency back-up generation. These units do not need natural gas pipelines, large electric lines, or water lines. They usually connect directly to the substations or transformers that serve load. Because these units are small, pollution control devices are usually not needed to meet air emission standards. However, when looking at the amount of air pollutants produced per unit of electricity, the importance of air pollution controls becomes evident. In addition, diesel units are most likely to be operated during peak energy demand periods such as hot, humid summer days when air quality concerns already exist.

2.3.5 Generation plants that use wind

Wisconsin does not have outstanding wind resources. Areas of the state with the potential for wind development include the southwestern quarter of the state, the Lake Superior shoreline, and the eastern portion of the state between the Lake Michigan shoreline and the Niagara Escarpment. Additionally there is the potential for off-shore wind development in Lake Michigan or Lake Superior. Wisconsin currently has 53 MW of wind power capacity. A total of 35 wind turbines have been constructed along the Niagara Escarpment with a capacity of about 23 MW. Another 30 MW of wind power is located near Montfort in southwestern Wisconsin.

No new wind projects have been constructed in Wisconsin since 2001. There is substantial desire to reduce the state's electrical dependency on the "dirtier" forms of generation. This is most clearly shown by the recently enacted state Energy Efficiency and Renewables Act (2006 Act 141) which requires utilities to meet an ambitious renewable portfolio standard (Section 2.5.5) and the renewal of the federal production tax credit, without which wind facilities may not be feasible (Section 2.5.6). The combination of this legislation should speed up the development of wind generation in the state.

In July 2005, the Commission approved the construction of the Forward Wind Project. This 200 MW wind farm will be located along the Niagara Escarpment in Dodge and Fond du Lac counties. In 2006, WEPCO submitted an application (Blue Sky/Green Field Wind Project) for the construction of up to 203 MW of new wind capacity in Fond du Lac County, also along the Niagara Escarpment. In addition to Forward and Blue Sky/Green Field, Wisconsin electric utilities and independent developers are currently planning for a total of 10 new wind power projects with a total capacity of approximately 650 MW (Table 2). This includes wind projects that are below the regulatory threshold requiring review by the PSC.

Table 2: Proposed Wind Farms (2006-2012)

Wind Project	On Niagara Escarpment	County	Town	Capacity (MW)	Turbines	Start Date	PSC Approved
Forward	X	Fond du Lac, Dodge	Oakfield, Byron, Leroy, Lomira	200	133	2006-2007	X
Eden	X	Fond du Lac	Eden	3.3	2	2006	
Addison	X	Washington	Addison	1.7	1	2006	
Butler Ridge	X	Dodge	Herman	54	33	2006	
Summit Ridge		Monroe	Cashton	98	40	2006-2007	
Cedar Ridge	X	Fond du Lac	Eden, Empire	98	40	2007	
Stockbridge	X	Calumet	Stockbridge	98	49	2007	
Friesland		Columbia	Randolph, Scott	80	48	2007	
Emerging Energy	X	Manitowoc	Mishicot	19.5	7	2007	
Blue Sky/Green Field	X	Fond du Lac	Calumet, Marshfield	203	88	2007-2008	Application Submitted
Horizon		Lafayette	Seymour	99	60	2007-2008	
Twin Creeks	X	Manitowoc	Two Creeks, Mishicot	98	49	Unknown	
			Totals	**1052.5**	**550**		

The majority of proposed wind farms are on the Niagara Escarpment. In addition to the 35 wind turbines already on the Niagara Escarpment, approximately 400 turbines are currently proposed for construction prior to 2008. To date, state agencies have not studied the potential cumulative impact of concentrated wind development of this region.

Wind generated electricity produces no air emissions. While the environmental effects of wind energy are mostly positive, there are some potentially negative impacts which include, bird and bat mortalities, aesthetics, noise, land use impacts, and property value reductions.

The PSC analyzes these and other potential impacts for utility-proposed wind farms whose costs exceed a specific threshold and for wind farms with a capacity of 100 MW or greater proposed by independent developers. Wind farms that are below these thresholds, undergo review by the local communities through zoning and the issuance of conditional use permits. DNR has limited authority with respect to the siting review of proposed projects. There is no state-wide long-term plan to aid developers in locating wind farms so as to minimize impacts to natural resources and wildlife. The proliferation of proposed wind farms also can have significant cumulative impacts on the rural landscape. Community responses to proposed wind projects vary greatly depending upon the success of the applicants' public outreach efforts and the significance of nearby natural resources that may be impacted by the project.

The construction of numerous wind turbines may have an impact on the state's generation mix. To supplement the low and unpredictable availability of wind generation, Wisconsin needs rapidly available alternative generation capacity such as natural gas-fired combustion turbines and combined cycle units, which add to the state's air emissions.

2.3.6 Generation plants that use nuclear fuel

Nuclear power in Wisconsin produces just over 16 percent of the state's electricity. There are two operational nuclear power plants currently in Wisconsin, Point Beach Nuclear Power Plant and the Kewaunee Nuclear Power Plant. Kewaunee was sold in 2005 to an independent power producer (IPP) that is under contract to a Wisconsin utility. A third nuclear plant near La Crosse has been closed since 1987. The primary environmental concerns regarding nuclear power plants are the disposal of the high-level radioactive wastes. Radioactive fuel rods are currently being stored at all three Wisconsin plants awaiting shipment to a secure high-level radioactive repository.

The recently passed Federal Energy Policy Act of 2005 (Section 2.5.1) provides incentives for new nuclear power plants. It is uncertain whether federal incentives, the need for additional clean generation, and developments of the Yucca Mountain disposal facility could lead to construction of new nuclear power plants in Wisconsin. The state currently has a moratorium on the construction of any new nuclear plants until a federally licensed facility is built with adequate capacity for all high-level nuclear waste generated in Wisconsin (Wis. Stat. § 196.493).

2.4 Pollution Impacts from Wisconsin Generation Plants

Efficiency is one means of reducing environmental impacts. As different generation technologies reach higher efficiency levels, fewer pollutants are potentially released for every

unit of fuel consumed. This is especially relevant for plants that burn fossil fuels which cause the majority of the state's air pollution. There is a definite trend towards improving the technology for both coal and natural gas fuels to achieve higher levels of efficiency.

Table 3: General Efficiency of Power Plants

Plant operation	Approximate efficiency
Coal Plants	
Traditional	30-35%
SCPC	42%
IGCC	42-46%
Cogeneration*	40–50%
Natural Gas Plants	
Older Combustion Turbines (CT)	26%
Newer Combustion Turbines (CT)	36%
Combined Cycle (CC)	50-55%
Cogeneration *	60-70%
Fuel Oil	
Internal Combustion Turbines	35%

* All power plants produce electricity. Cogeneration plants produce electricity and steam.

2.4.1 Generic comparison of pollution emitted by power plants

Figures 3 through 6 compare the pollutants from a sampling of Wisconsin plants based on the type of plant and fuel burned. These figures show that, in most cases, the use of the latest pollutant control methods can produce a significant reduction in the pollutants emitted.

Figure 3: Comparison of Pounds of Carbon Dioxide Typically Emitted from Different Types of Power Plants

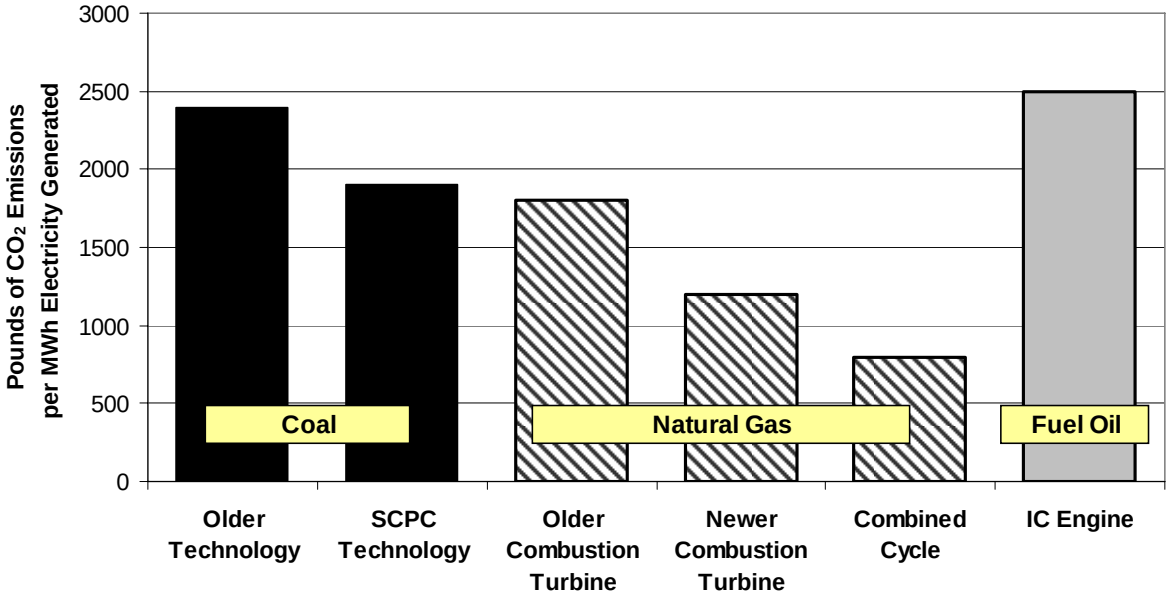


Figure 4: Comparison of Pounds of Particulate Matter (PM_{10}) Typically Emitted from Different Types of Power Plants

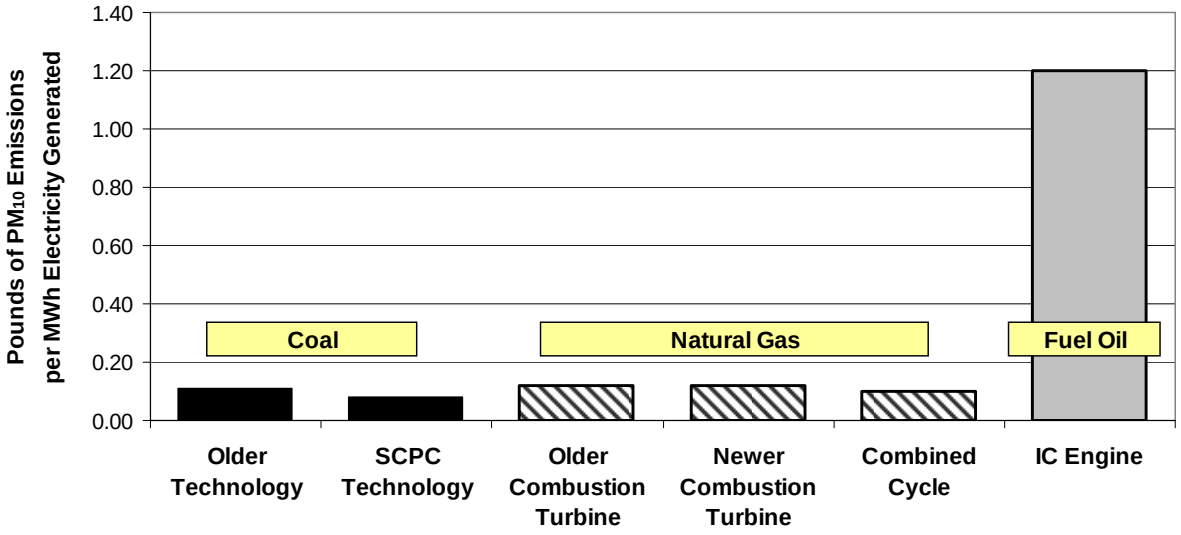


Figure 5: Comparison of Pounds of Nitrogen Oxides Typically Emitted from Different Types of Power Plants

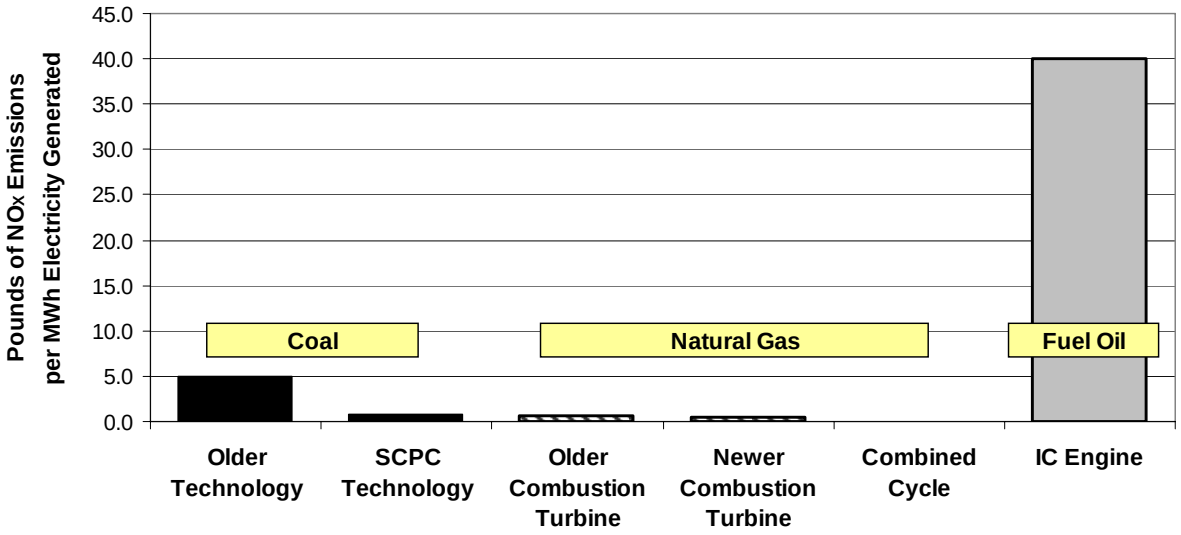
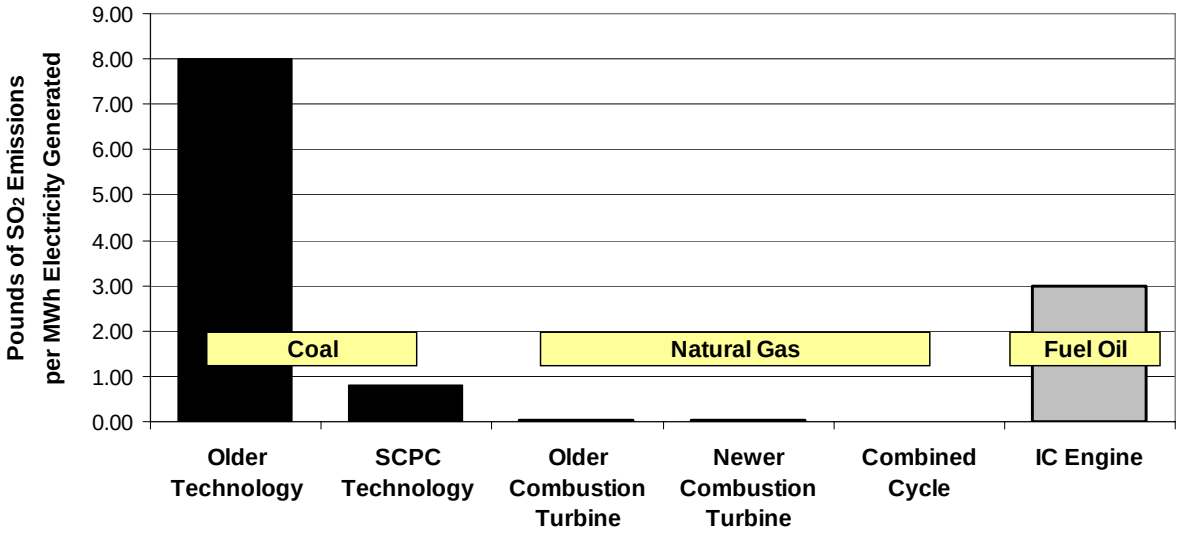


Figure 6: Comparison of Pounds of Sulfur Oxides Typically Emitted from Different Types of Power Plants



2.4.2 Greenhouse gases

Greenhouse gases are trace gases that trap heat in the earth's atmosphere. Three major human-influenced greenhouse gases are carbon dioxide, methane, and nitrogen oxide. Global warming has been the focus of many studies over the past decade. Recent scientific evidence from a variety of sources has implicated human-caused increases in greenhouse gases as a major driver of global warming. Climate model simulations indicate that increased surface temperatures of the 20th century are too large to have been caused by climate variability. Additionally, the results of climate modeling have recently been reconciled with the results of climate observations.[2] The average global temperature increase for July 2005 was 1.1 ºF (0.6 ºC) above the 1880-2004 long-term mean.[3] Greenhouse gases can have a number of significant environmental impacts globally, as well as in Wisconsin. Localized impacts could include warmer weather with increased frequencies of droughts, floods, heat waves, and severe weather events, decreasing water levels and water quality in the Great Lakes and inland waters of the state, ecosystem changes due to climate changes, decreased crop productivity, increased potential for forest fires, and increased potential for insect-borne diseases.

One of the major sources of carbon dioxide is fossil fuel-burning power plants. Globally, approximately 283 billion tons of carbon dioxide has been added to the atmosphere since 1751.[4] Carbon dioxide emissions are not regulated by the USEPA or Wisconsin. Wisconsin's electric generators produce carbon dioxide emissions in similar percentages as the rest of the nation. In April 2005, the USEPA finalized its, "Inventory of U.S. Greenhouse Gas Emissions and Sinks

[2]T.R. Knutson et al., "Assessment of Twentieth Century Regional Surface Temperature Trends using the GFDL CM2 Coupled Models," http://www.usgcrp.gov/usgcrp/new.htm#variabilityandchange, accepted 26 Sept 2005 for publication in Journal of Climate

[3] http://www.noaanews.noaa.gov/stories2005/s2489.htm

[4]http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2005.html

1990-2003".[5] It reported that electric generation is the largest single source of carbon dioxide emissions in the US, representing about 41 percent of all carbon dioxide emitted. In Wisconsin, DNR estimated that 40 percent of the state's carbon dioxide is emitted from power plants. These emissions increased approximately 29 percent in Wisconsin between 1990 and 2000. Increases in the emission of greenhouse gases are expected to continue to climb without any regulatory oversight.

The only current management for greenhouse gases in the U.S. is a carbon trading program being created by seven northeastern and Mid-Atlantic states. The Regional Greenhouse Gas Initiative is planned to go into effect in 2009. Critics argue that emissions trading does little to solve pollution problems overall, as groups that do not pollute sell their conservation to the highest bidder. Overall reductions would need to come from a reduction of permits available in the system. Nevertheless, the transfer of wealth from polluters to non-polluters provides incentives for polluting firms to change, especially if the market price for pollution credits is very high.

2.4.2 Current and projected air emissions and wastes generated by utilities

For this SEA, each major Wisconsin electricity generator was asked to provide aggregate emission estimates for the period 2006-2012 for six air pollutants and ash. Their data was totaled and summarized in Tables 4 and 5. However, because current air emission regulations are in a state of flux, these estimates most likely do not reflect how these changes would affect emissions (see Section 2.5). Even so, state-wide emissions of sulfur dioxide, nitrogen oxides, particulates, and mercury would be reduced. Unfortunately, recycled ash would slightly decrease and landfilled ash would more than double. Table 5 clearly illustrates that within the category of electric generation, coal-burning plants produce the majority of the state's pollution.

Table 4: Summary of Estimated Statewide Annual Air Emissions and Ash, 2006-2012

Year	Landfilled Ash	Recycled Ash	SO_2	NO_X	CO_2	PM	PM_{10}	Mercury
	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(pounds)
2006	119,093	1,116,833	174,525	59,755	42,058,145	18,671	10,254	2,003
2007	117,083	1,131,146	163,024	53,656	42,664,995	18,160	9,495	2,047
2008	163,769	1,117,671	145,049	49,138	44,215,077	17,713	9,254	1,800
2009	205,085	1,078,410	124,798	45,438	45,008,888	16,174	8,984	1,805
2010	200,593	997,674	111,959	41,118	42,811,026	12,393	6,540	1,710
2011	255,338	1,003,637	111,783	40,634	44,301,141	12,195	6,438	1,729
2012	301,182	1,006,710	113,167	41,290	46,138,477	12,348	6,526	1,759
Percent Change	**153**	**(10)**	**(35)**	**(31)**	**10**	**(34)**	**(36)**	**(12)**

[5] Ibid.

Table 5: Summary of Estimated Statewide Annual Air Emissions and Ash by Fuel Type, 2006

Fuel	Land-filled Ash	Re-cycled Ash	SO_2	NO_X	CO_2	PM	PM_{10}	Mercury
	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(lb)
Coal	108,929	1,111,531	174,191	58,018	40,390,728	17,953	10,045	1,983
Natural Gas	0	0	6	422	879,091	404	113	0
Fuel Oil	0	0	62	139	36,651	18	6	0
Other*	10,164	5,302	70	809	360,691	96	63	20

*Wood, RDF, Landfill Gas, Digester Gas

Figures 7-10 show how the emission totals of sulfur dioxide, nitrogen oxides, carbon dioxide, and mercury are estimated to change over the next six years. However, despite the increase in generation required to keep up with increasing demands, the utilities project that most pollutants will decrease. It is uncertain whether their decrease will meet proposed emission regulations.

Figure 7: Estimates of Sulfur Dioxide Emissions from Utility Power Plants

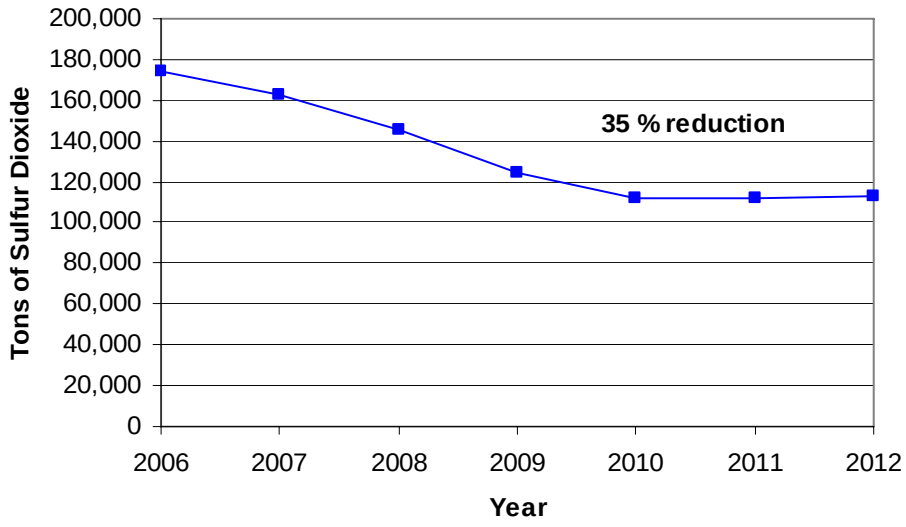


Figure 8: Estimates of Nitrogen Oxides Emissions from Utility Power Plants

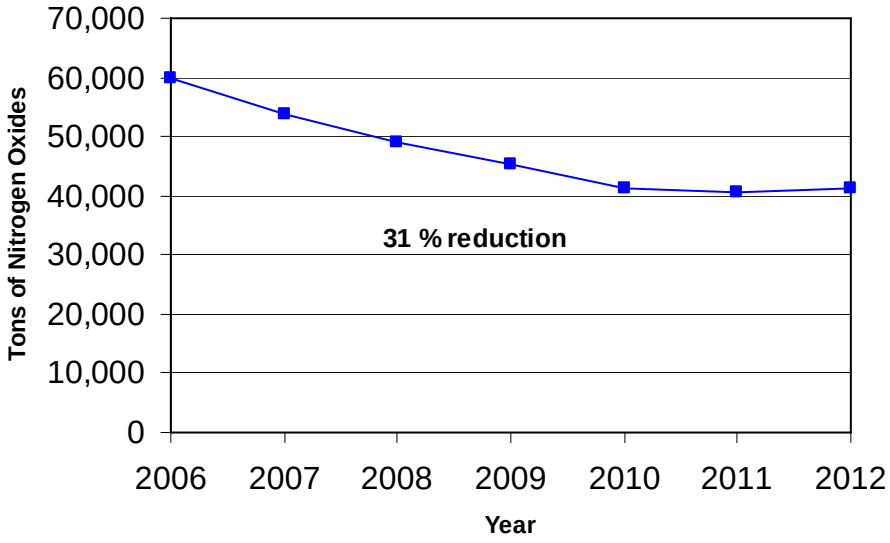


Figure 9: Estimates of Carbon Dioxide Emissions from Utility Power Plants

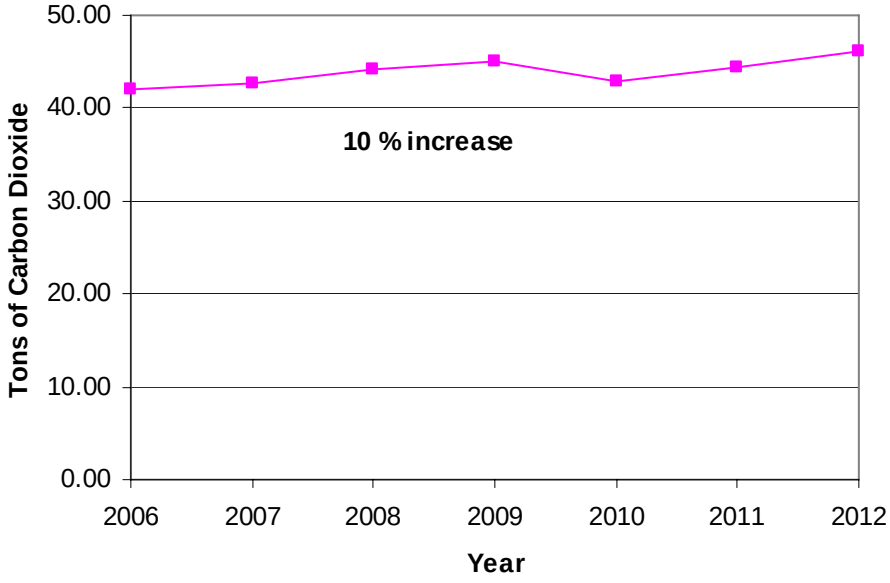
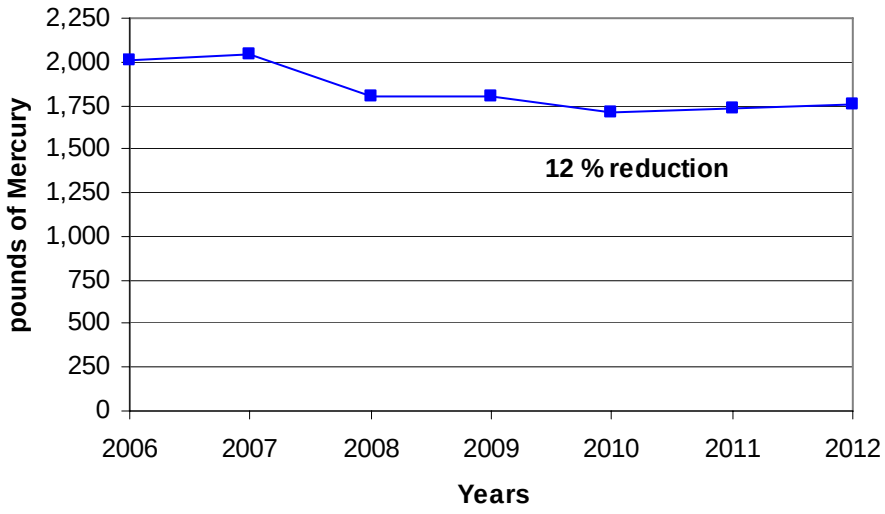


Figure 10: Estimates of Mercury Emissions from Utility Power Plants



2.5 Federal and State Regulations Affecting Potential Environmental Impacts from Generation Facilities

2.5.1 Federal Energy Policy Act of 2005

President Bush signed the Energy Policy Act of 2005 (EPAct) into law on August 8, 2005. Several of the provisions of EPAct encourage the construction of renewable and lower polluting electric generation technologies and the installation of air pollution control facilities.

The act provides up to $200 million annually for research in coal-based IGCC technologies. There is a loan guarantee program and direct grants to promote the use of more efficient and lower polluting clean coal generating equipment. The EPAct also establishes three investment tax credits for clean coal facilities: up to 20 percent for IGCC projects; up to 15 percent for advanced coal-based projects; and up to 20 percent for industrial gasification projects.

The EPAct encourages the installation of air pollution control facilities in older plants. It allows for the amortization of 60 percent of the cost of certain pollution control equipment on post-1975 power plants, and reduces the recovery period for these facilities from the current 20 years to 7 years.

The Act establishes a tax credit of 1.8 cents per kWh for new advanced nuclear power facilities. The tax credit applies to electricity produced over an 8-year period and to those plants placed in service between the date of enactment and prior to January 1, 2021. The Department of Energy is also authorized to provide loan guarantees of up to 80 percent. However, Wisconsin still has a moratorium on the construction of new nuclear power plants.

2.5.6 Federal Production Tax Credit

The federal production tax credit (PTC) plays a major role in the economics of wind power projects. It is debatable whether wind projects would be feasible without this credit. The first

PTC was signed into law in 1992 and provided 1.5 cents per kilowatt hour (kWh) tax credit to corporate entities building new renewable energy production facilities such as solar, biomass, wood chip, geothermal, and wind power projects. The tax credit increased each year by the official rate of inflation for the first ten years of operation of the facility. Since its inception, the tax credit has been allowed to lapse several times.

As part of the EPAct, the PTC was again extended for newly constructed renewable facilities that are operational prior December 31, 2007. The credit was increased to 1.9 cents per kWh and is available for 10 years. However, because the PTC legislation has a short sunset date and is dependent upon political will to be renewed every few years, long term planning for wind projects is difficult.

2.5.2 Clean Air Mercury Rule (CAMR)

In Wisconsin, power plants emit approximately 2,700 pounds of mercury annually,[6] resulting in 65 percent of all reported mercury emissions in the state.[7] Wisconsin ranks 15th in power plant mercury emissions, nationwide.

Mercury particles in emissions rise into the atmosphere where they bind with precipitation and fall back to earth. Through rain, snow, and drainage, mercury ends up in lakes and rivers. Once in the water, bacteria convert mercury into a form easily absorbed by fish and other organisms. Eating contaminated fish is the primary pathway for human exposure and poses health risks. Nearly all of Wisconsin's lakes and rivers are under a Mercury Advisory for fish consumption, suggesting people avoid or limit their consumption of certain types of fish.

Mercury is a potent neurotoxin that can affect the brain, heart, and immune system. Developing fetuses and children are especially at risk for learning disabilities, developmental delays, and problems with attention and memory. Studies also indicate that mercury exposure is associated with an increased risk of heart attacks in adults.

On May 18, 2005, the federal Clean Air Mercury Rule (CAMR) established mercury control requirements for new and existing coal-fired boilers that serve a generator larger than 25 MW and produces electricity for sale. Also affected are coal-fired generation units that supply more than one-third of potential electric output capacity and more than 25 MW to a utility for sale. The national rule sets a declining cap on mercury emissions in two distinct phases. The first cap is proposed to take effect in 2010. The final cap would take effect in 2018 and would reduce mercury emissions by approximately 69 percent. Approximately 48 coal-fired boilers operated by eight electric utilities in Wisconsin are subject to the provisions of CAMR.

This national rule details two ways to reduce mercury emissions from coal-fired power plants. The USEPA's preferred method is a nation-wide cap-and-trade program. Sources are assigned allowances based on past emissions. The power plant owners have a choice of either reducing mercury emissions to or below the level of their assigned allowances or they may purchase additional allowances from other sources that have reduced their emissions below the amount of

[6] DNR Factsheet: Wisconsin Regulations for Controlling Mercury Emissions from Electric Utilities, WDNR, Bureau of Air Management, Feb. 2005.
[7] U.S. PIRG Education Fund, Made in the USA, Power Plants and Mercury Pollution Across the Country, Sept. 2005

their assigned allowance. The USEPA's alternative method is to establish a national Maximum Achievable Control Technology (MACT) standard on a source by source basis to reduce mercury emissions. The alternative MACT rule would become effective in 2007 and affect all coal-fired power plants. On average, the USEPA expects this version of the rule to reduce mercury emissions by 29 percent.

Wisconsin has until November 18, 2006 to submit a state plan to the USEPA that details how the CAMR requirements will be met. Wisconsin's annual budget for mercury from 2010 to 2017 would be 1,780 pounds. After 2018, the state budget would be reduced to 702 pounds per year.

Prior to the enactment of CAMR, Wisconsin had adopted new mercury rules which would produce a 75 percent reduction in mercury emissions from the state's power plants by 2015. When fully implemented, the Wisconsin rules would have reduced mercury emissions from power plants to less than 700 pounds per year. This would have been more restrictive than CAMR. The federal program further differs from the state mercury rule in that there are no credits for early reductions, no electric reliability waivers, no periodic review of requirements, no variance provisions, and reduction levels are based on emissions from the stack rather than the mercury content of the coal burned. Air permits issued for the coal plants currently under construction, Weston 4 and Elm Road Units 1 and 2 already require a mercury control greater than 80 percent.

In September 2004, the Wisconsin state code (Wis. Admin. Code Ch. NR 446) was revised to require that Wisconsin's rules not be more restrictive than federal mercury emission limits for major utilities.

Wisconsin is one of 15 states, five environmental groups, and four tribes that have filed a lawsuit challenging the cap and trade approach of CAMR to achieve mercury emission reductions. The contention is that this approach is inappropriate for a hazardous air pollutant like mercury because meaningful reductions can be significantly delayed and local mercury deposition may not be addressed. In August 2005, the court denied the petitioners a request for a stay on the implementation of CAMR. However as a separate issue from the legal challenge, the USEPA announced on October 28, 2005 that it would reconsider the CAMR as well as its determination that it was not appropriate or necessary to regulate hazardous air emissions from utilities under Section 112 of the Clean Air Act. The comment period ended on December 19, 2005.

The outcome of the state's lawsuit and EPA's reconsideration may, at some point, affect the details regarding mercury control. However, it is apparent that utilities will be required to lower their mercury emissions, especially from older coal-burning plants. This uncertainty is the reason cited by most utilities for waiting to determine the specific pollution control modifications required for their existing units and their units in the planning process.

2.5.3 National Ambient Air Quality Standards (NAAQS)

2.5.3.1 Fine particulate matter

Particulate matter is a complex mixture of tiny solid or liquid particles, composed of chemicals, soot, and dust. The two primary sources of particulates are nitrogen oxides and sulfur dioxide. These precursor emissions are being regulated under Clean Air Interstate Rule (CAIR). Coarse

particles (10 to 2.5 micrometers in diameter), known as PM_{10}, have limited spatial impact and tend to settle rapidly in the downwind area near the emission point. Very fine particles (less than 2.5 micrometers in diameter), are known as $PM_{2.5}$, can remain suspended in the air for long periods of time, traveling 10 to 100 miles from their original source. The USEPA has determined that sources in Wisconsin significantly contribute to the fine particulate pollution in Illinois, Indiana, and Michigan. Nationally, the biggest sources of particulates are older, coal-fired power plants, industrial boilers, and gas- and diesel-powered vehicles. Fine particulate pollution is a year-round problem. In Wisconsin, it is more often a problem in the winter, but more recently has occurred in the summer months, as well.

Both sizes of particles can be inhaled and penetrate the sensitive respiratory tract, causing serious health problems. Scientists have correlated exposure to airborne particulates with increased hospitalizations for asthma attacks, worsening of lung disease, and heart damage. Recent studies have suggested a link between particulate matter and lung cancer. People with heart or breathing problems, the elderly (more than 65 years old), and children are most sensitive to these effects.

Particulates are regulated as a criteria pollutant under the National Ambient Air Quality Standards (NAAQS). The USEPA has set standards for PM_{10} and $PM_{2.5}$, which are currently met by all the counties of Wisconsin. The USEPA is in the process of reviewing its $PM_{2.5}$ and has proposed lowering the 24-hour standard from 60 to 35 micrograms per cubic meter. Regulations requiring additional $PM_{2.5}$ reductions could cause some counties in southeastern Wisconsin to become non-attainment, but the USEPA is expecting that compliance with CAIR (discussed in Section 2.5.4) should bring these counties back into attainment by 2015.

2.5.3.2 Ozone

Ozone is a principal component of smog and can trigger health problems such as chest pain, coughing, and lung damage in addition to aggravate existing respiratory and heart problems. Ozone is created when volatile organic compounds and nitrogen oxide emissions interact with sunlight. Ozone levels rise most frequently in the summer months. Research has shown that ozone formed in one area can drift on air currents, increasing air quality problems elsewhere. As such, Wisconsin emissions significantly contribute to ground-level ozone pollution in New York and Michigan. Reductions in nitrogen oxide emissions in Illinois, Indiana, Iowa, and Missouri would improve Wisconsin's ozone problems.

Ozone is regulated under the NAAQS by an eight-hour standard. The previous one-hour standard was revoked on June 15, 2005. The USEPA has designated Door, Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan Washington, and Waukesha counties as non-attainment for the new ozone standard. This designation triggered Clean Air Act requirements for adopting rules that reduce nitrogen oxides and volatile organic emissions sufficiently to demonstrate attainment of the standard by 2010.

During recent summer months, high levels of ozone have occurred in the designated non-attainment counties and elevated ozone levels in the attainment counties. It is expected that non-attainment counties will need to reduce volatile organic compounds and nitrogen oxide emissions to attain the standard. It is also expected that regional nitrogen oxide and ozone emissions will need to be reduced to assist non-attainment areas.

The USEPA is proposing a regional cap and trade program to facilitate regional nitrogen oxide emission reduction goals. This program is part of the Clean Air Interstate Rule and discussed in the following section.

2.5.4 Clean Air Interstate Rule (Nitrogen Oxides and Sulfur Dioxide)

The USEPA has recognized the regional nature of ozone and particulate air pollution and that, in order to effectively reduce these pollutants, their precursor emissions must also be reduced. The precursor emissions for ozone are volatile organic compounds and nitrogen oxides. The precursor emissions for fine particulate matter are ammonia, nitrogen oxides, and sulfur oxides. Emission sources of volatile organic compounds include solvents, petroleum products, and gasoline. These pollutants are now tightly regulated. Major sources of ammonia include emissions from farm animal urine and feces. Ammonia is both difficult and potentially costly to regulate. Thus, the purpose of the recent Clean Air Interstate Rule (CAIR) is the reduction of sulfur dioxide and nitrogen oxide emissions.

Vehicles and electric utilities each contribute about 40 percent of the nitrogen oxide emissions statewide. Nitrogen oxide compounds not only contribute to ozone and particulate pollution, but nitrous oxide (N_2O) is a greenhouse gas and nitric acids contribute to acid rain.

Sulfur is a natural component of coal and oil. Sulfur oxides are produced by the combustion process. Much of the coal burned in Wisconsin comes from the eastern U.S. which has a higher than average sulfur content. The emissions from coal-fired power plants currently account for 73 percent of all sulfur dioxide emissions in the state.

On March 10, 2005, the USEPA issued CAIR which caps the combined power plant emissions of sulfur dioxide and nitrogen oxide for much of the eastern United States. CAIR is designed to assist states in meeting the NAAQS for ground-level ozone and fine particulate pollution. The program has two phases with deadlines in 2010 and 2015.

In 2003, the USEPA reported that Wisconsin sources produced 82,000 tons of nitrogen oxide emissions. Through existing state programs, the USEPA estimated that nitrogen oxide emissions will be reduced by 13,000 tons in 2015. CAIR will further reduce these emissions by an additional 37,000 tons for a total reduction of 61 percent.

In 2003, the USEPA reported that Wisconsin produced 193,000 tons of sulfur dioxide emissions. Through existing programs such as the acid rain control laws, the USEPA estimated that sulfur dioxide emissions will be reduced by 57,000 tons or almost 30 percent by 2015. CAIR will further reduce these emissions by an additional 4,000 tons.

As a compliance option, Wisconsin has the option of submitting a revised State Implementation Plan (SIP) that either 1) caps both sulfur dioxide and nitrogen oxide emissions year-round from all sources or 2) caps emission from power plants only and includes participation in a USEPA administered cap-and-trade program for the two pollutants. The cap-and-trade program would be based on the current acid rain and nitrogen oxide budget trading programs. Wisconsin is required to submit the SIP to the USEPA by September 10, 2006.

This program will affect all electric generation combustion units in Wisconsin. It is very likely that additional controls such as the addition of Selective Catalytic Reduction (SCR) components will need to be installed at many of the existing generation units. Compliance with the nitrogen oxide requirements will require, in part, making deeper summer nitrogen oxide emission reductions in southeastern Wisconsin and perhaps making some reductions year-round rather than during the summer months only. The remainder of the emission reductions might be achieved by making nitrogen oxide emission reductions state-wide.

To meet the sulfur dioxide emission reductions, some existing Wisconsin units may need to install scrubbers. The cap-and-trade program may allow some units to avoid scrubber installation as long as other units achieve greater than average emission reductions. In the past, many Wisconsin units have achieved compliance with state and federal acid rain sulfur oxide requirements by burning low-sulfur western coal. The only other likely compliance strategy would be to switch from coal to natural gas. It is unlikely that fuel switching would be sufficient to meet the CAIR requirements.

There are additional related requirements that Wisconsin will need to pursue during the same timeframe to address large stationary source emissions in regard to regional fine particulate and regional haze. These programs include: 1) Reasonably Available Control Technology, 2) Reasonably Available Control Measures, and 3) Best Available Retrofit Technology Program (regional haze). EPA does not expect the CAIR rule, alone, to be sufficient for Wisconsin counties to attain the 8-hour ozone standard. A multi-state agreement between some or all of the states in the Lake Michigan region may be needed to provide the additional levels of emission reduction necessary to meet ozone, fine particulate, and visibility improvement objectives.

2.5.5 Renewable Portfolio Standard

On March 17, 2006, Governor Doyle signed into law the Energy Efficiency and Renewables Act (Act 141). It creates a legal requirement for electric utilities and cooperatives to meet a renewable portfolio standard. Electric providers are required to increase the amount of renewable electricity they sell two percentage points above their 2004 level by 2010 and six percentage points above their 2004 level by 2015. Renewable energy use statewide will be required to average 10 percent by 2015. The legislation addresses other issues such as energy conservation, efficiency, and renewable research.

In 2004, about 3.44 percent of all electrical energy sold in Wisconsin was generated from renewable resources. This new portfolio standard, if supplied mostly by wind power, would require approximately 2,000 MW of additional renewable capacity by 2015. The legislation includes an expansion of the definition of renewable energy facilities to include all hydroelectric plants. Besides wind generation and hydroelectric energy, other renewable sources provide only small quantities of additional generation to the state's energy mix. The only renewable energy source that is currently constructible on a significant scale is wind. Prompted by a need to meet this renewable portfolio standard, there will most likely be a proliferation of wind farm construction inside and outside of Wisconsin.

2.5.6 Shared Revenue - Power Plant Siting Incentives

The revised shared revenue program (Wis. Stats. Ch. 79) in 2003 significantly changed and increased shared revenue payments to municipalities. The maximum payment to a municipality or county under the prior formula was $750,000 per year and was based on the power plant's net book value. In contrast, payments under the new shared revenue program are based on a plant's MW capacity and do not decline over time. Over the life of the plant, municipalities and counties will receive tens of millions more dollars than what they would have received under the former program. The program also provides additional shared revenue dollars as incentives for the following specific types of power plants.

- Plants constructed on or adjacent to an existing power plant site, a former plant site, or a brownfield. Brownfields are abandoned, idle, underused industrial or commercial sites, or sites whose development is hindered by their potential environmental contamination.
- Baseload plants with a capacity of at least 50 MW
- Plants that derive energy from alternative energy sources such as a renewable resources, garbage, or nonvegetation-based wastes. Renewable fuels include hydropower, solar, wind, geothermal, and biomass.
- Cogeneration plants with a capacity of at least one MW.

3.0 Transmission

3.1 Proposed Transmission Construction

The Wisconsin transmission system is managed by three companies, American Transmission Company (ATC), Northern States Power-Wisconsin (NSPW), Inc., and Dairyland Power Cooperative (DPC). Wisconsin currently has approximately 11,500 miles of transmission lines.

The utilities have submitted a list of all high voltage transmission projects, 69 kV or greater and upgrades or rebuilds of lines greater than 100 kV for which construction is expected to begin prior to December 31, 2012. This list is included in Appendix Table A-1. Upgrading or rebuilding transmission lines may require new transmission structures and/or new right-of-way (ROW). Appendix Table A-1 shows a list of 35 proposed projects which total $1.65 billion. This includes the $429 million Arrowhead to Weston line currently under construction. This also includes a $297.2 million "representative" ATC Access project from West Middleton to Salem. All but two of the construction projects are within ATC's territory. Nine of the 35 projects have already been approved for construction. Seven projects involve high-voltage 345 kV lines. The majority of the projects involve construction of 138 kV lines.

Appendix Table A-2 lists eight transmission projects that require new ROW. Figure 11 shows the location of these projects. The portion of the projects that require new ROW totals almost 200 miles. However, depending on the specific routes chosen by the Commission, much more new ROW may be required.

Appendix Table A-1 contains one representative transmission project included in the ATC Access Study Initiative. The Access Study identified five potential extra high voltage projects for increasing import capability and one lower voltage alternative. The Commission opened docket 137-EI-100 to investigate this study. In March 2006, the Commission staff issued a final report.[8] Some of the final reports findings included:

- Changes in federal/state law and regulations have moved the electric industry toward regionalization and increased competition in the wholesale energy market.
- A rigorous analysis should be performed by the PSC prior to approving any extra high voltage transmission projects.
- Coordinated planning and regional cooperation with all transmission owners, utilities, and neighboring states must be considered to help reduce the likelihood of duplicative or underused facilities.

The drivers for new and/or upgraded transmission facilities are load growth, power transactions between utilities, new power producers, and the condition of existing facilities. In addition to meeting increased and new transmission service, the transmission construction is also geared toward providing safe and reliable service. ATC reports that while the annual load growth for the state averages 2 percent, some areas are experiencing growth as high as 8 percent. In particular, Madison, Lake Geneva, Green Bay and Rhinelander are areas experiencing high growth rates. The current construction cycle in Wisconsin has placed strong upward pressure on rates.

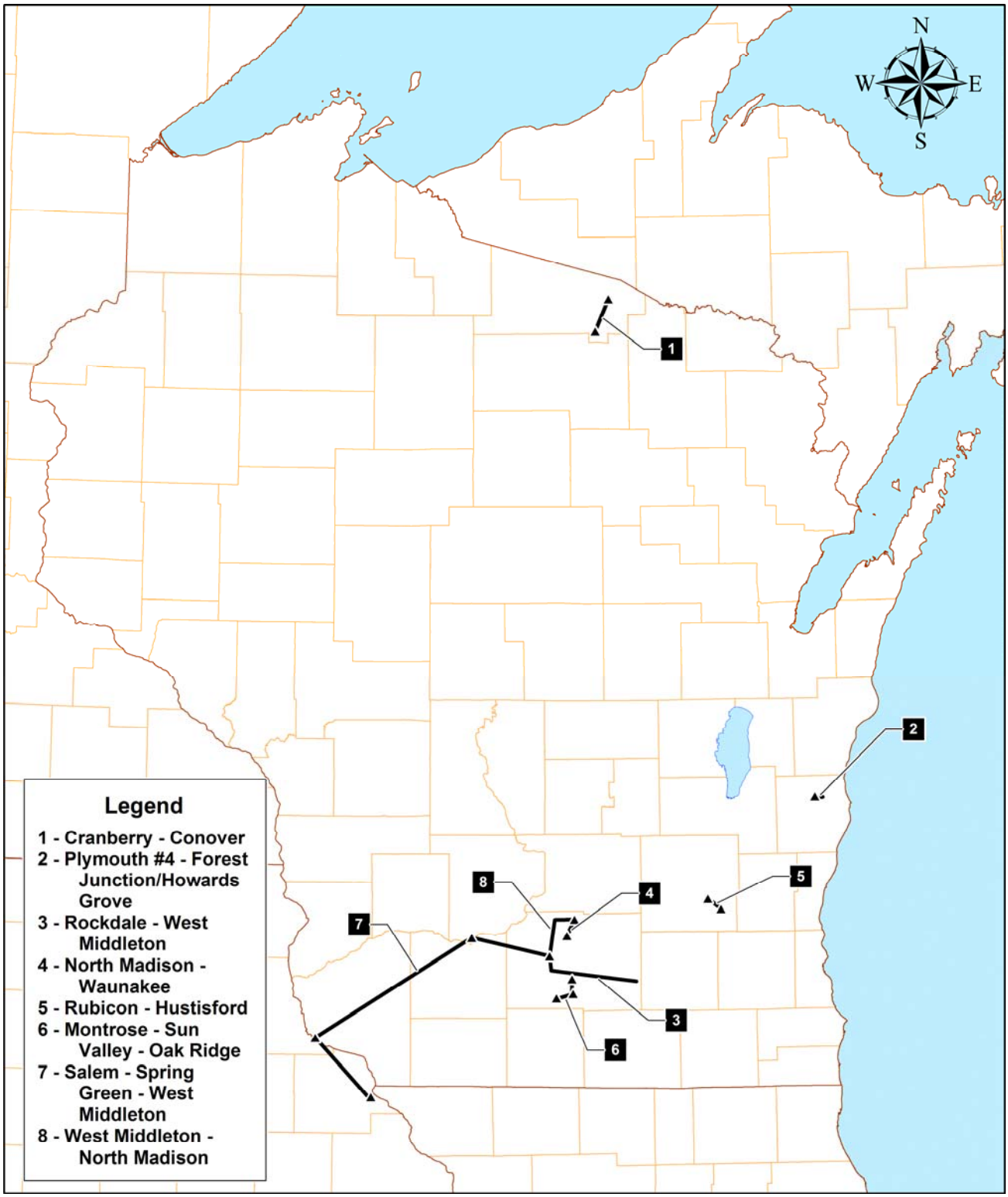
3.2 Environmental and Health Affects of Transmission Lines

3.2.1 Potential Environmental Impacts

The previous SEA listed 82 projects to be constructed between 2002 and 2009 as opposed to the 35 listed in this SEA for the period between 2006 and 2012. It appears that the majority of construction starts would occur in the years of 2006 through 2008 and then taper off. While the trend for new transmission construction will eventually slow down a bit from previous years, there are still a significant number of projects that will require new ROW. Projects that require new ROW will have environmental and community impacts. Many new construction projects will be routed through already congested areas such as Madison and therefore have potentially significant environmental and community impacts. Transmission projects that satisfy more regional competitive concerns may also cause significant impacts and controversy due to their size and length. All projects that require new ROW will need to be analyzed by the PSC to verify that impacts to environmental and community resources are avoided, minimized, or mitigated. Input from resource experts, communities, property owners, and the public will be necessary to properly site these new transmission corridors. Appendix Table A-3 contains a list of the communities where transmission construction or upgrade is anticipated.

[8] PSC Ref # 51295, Docket 137-EI-100

Figure 11: Proposed High-Voltage Transmission Lines Requiring New ROW



3.2.2 Electric and Magnetic Fields (EMF)

Electric and magnetic fields have been studied since the late 1970s. Concern has primarily focused on the magnetic field. The size of the magnetic field is related to current flow and cannot be predicted from the line's voltage. Any device that uses electric current has a magnetic field. For this reason, distribution lines and common electrical appliances, as well as high-voltage transmission lines produce measurable magnetic fields. Distribution lines can produce levels of magnetic fields that equal those produced by transmission lines.

Concerns over the health effects of EMF, specifically childhood leukemia, have been discussed for many years. However, scientists have found only inconsistent and, at best, weak statistical associations between exposure to magnetic fields and human health effects. Despite the lack of any study that proves a cause-and-effect relationship, this issue has remained controversial. The most recently published studies have concluded that epidemiological studies are inconclusive and cannot be used as a basis for quantitative restrictions on human exposure to EMF. The Commission continues to monitor the results of these studies.

Utilities that apply to the Commission for permission to build a new transmission line must supply detailed EMF data. Their applications must contain estimates of the size of the magnetic fields that would be created by the new line and how the magnetic fields would decrease with distance from the line. EMF levels are also calculated for a variety of possible current flows and for flows projected after ten years of in-service use. Commission staff checks the utility's calculations and then analyzes each route for potential exposure to magnetic fields. This information is provided to the public and is considered in route selection decisions made by the Commission.

3.3 Federal and State Regulations Affecting Potential Environmental Impacts from Transmission Facilities

3.3.1 Federal Energy Policy Act of 2005

The recently enacted Energy Policy Act of 2005 (EPAct) contains two provisions that address the siting of transmission lines. The Department of Energy (DOE) has been given the authority to designate any geographic area experiencing transmission capacity constraints or congestion that adversely affects consumers as a "national interest transmission corridor". DOE is required to identify these corridors within one year of enactment and every three years thereafter.

The second provision applies to FERC having "backstop" siting authority to issue permits for construction or modification of transmission facilities if a state cannot or will not act in a timely manner, or acts in a manner that renders a project uneconomical in a national interest transmission corridor. These provisions may promote better cooperation among states involved in interstate transmission construction project. A concern regarding this policy is that FERC may not apply the same thorough environmental and community impact analysis that is currently a policy of this Commission. Public input may also not be given the same consideration as it currently is by the state.

Finally, the act reduces the depreciation schedule for electric transmission lines (69 kV or higher) from 20 to 15 years. The purpose of this is to encourage investment in new transmission facility construction.

3.3.2 Wisconsin Act 89

3.3.2.1 Pre-application Process

The passage of Act 89 in 2003 created a specific pre-application process for transmission lines in Wis. Stat. § 30.025 (1m). The new review process is very front-end loaded, in that it synchronizes the reviews of both the PSC and the DNR and it requires a high degree of communication and information sharing among the state agencies and the utility at the earliest stages of the process. In the pre-application phase, a utility must notify and meet with the agencies prior to submitting its applications. This pre-application consultation identifies major issues and concerns that the agencies might have, the scope of the project, the site or route alternatives to be included in the applications, and it defines the information needed in the application.

This pre-application process becomes even more crucial for transmission projects because Act 89 revisions to Wis. Stat. § 196.025(2m)(c) limits the number of alternatives presented in an application to a proposed route and one alternative route. ATC specifically seeks out public input in this winnowing process of reducing route alternatives through numerous pre-application public meetings.

The changes to the statutes are intended to have the following effects. Identification of a project's potential environmental and community issues early on should help ensure that the applications submitted to the PSC and DNR are consistent and thorough. The time the utilities spend working with the two agencies and the public prior to filing their applications should simplify the review process of the resulting application.

3.3.2.2 Corridor-Sharing

According to Wis. Stat. § 1.12(6), the PSC should, to the extent practical, site new electric transmission facilities within existing rights-of-way. The Commission has long had a policy that promotes corridor-sharing. Corridor-sharing means that the ROW of a transmission line overlaps or is within the ROW of other utility corridors, roads, railroads, or recreational trails. In addition, a transmission line can share a ROW with an existing line by placing both circuits on one new structure (and removing the existing structure). The rule requires that to the greatest extent feasible and consistent with economic, engineering, electric reliability, and environmental protection, new transmission lines will utilize these corridors in the following priority:

- Existing utility corridors
- Highway and railroad corridors
- Recreational trails to the extent that the facilities may be constructed underground and do not significantly impact environmentally sensitive areas
- New corridors.

Corridor-sharing sometimes reduces impacts by locating linear land uses together, and minimizes the amount of land affected by new easements. Since existing land uses have developed around the existing ROW, there is likely to be less disruption to existing and future land uses. This also

reduces the problem of corridor proliferation on a larger scale, where land is repeatedly divided by increasing numbers of roads, pipelines, power lines, etc. However, the statute has the potential to unduly burden some landowners with multiple utility corridors that limit the use and enjoyment of their property.

Experience has shown that corridor-sharing works better with some types of existing corridors than others. In general, existing electric line ROWs and major highways are better routes for new transmission lines than local roads, railroads, and natural gas pipelines. Local roads can have very narrow existing ROWs with residences and shade trees located very near to the edge of the road. Locating a transmission line in this type of setting might be aesthetically undesirable and difficult to engineer. Railroads may be built on narrow embankments in wet areas and often do not provide sufficient access for construction. Natural gas pipelines, as underground structures, often have narrow ROWs. Co-locating new transmission lines adjacent to pipelines creates a significantly wider ROW, and is an aboveground feature that can interfere with agricultural operations and have adverse aesthetic impacts. These types of corridor sharing do not necessarily minimize the amount of land affected or reduce impacts to the environment or private property owners.

Using an existing ROW is frequently more costly than building in a new location, due to the need for designing a new power line to fit into an existing ROW, or using special construction techniques to allow continued operation of the existing line during construction. Taking existing lines out of service for new construction may contribute to congestion on the electric transmission system.

However, in areas where property owners have become accustomed to an existing transmission line and it's ROW, corridor-sharing may make practical sense. Single-circuited lines when replaced with double-circuited lines often require minimal adjustments to the existing ROW and the impacts would be less than using a new easement. Transmission lines that are located on highways with wide existing ROWs and residences sufficiently set back from the road are another instance when corridor sharing can benefit communities and the environment.

3.3.3 Wisconsin Act 24 – Use of Municipal and County Lands for Transmission Easements

Wisconsin Act 24 was enacted on August 4, 2005. This addition to Wis. Stat. §196.491 applies to high-voltage transmission lines that receive a Certificate of Public Convenience and Necessity from the Commission with portions to be constructed on land owned by a county, city, village, town, public board, or commission. It dictates that necessary easements on municipal or county public lands shall be conveyed to the electric utility at fair market value. It also describes how fair market value will be determined. The purpose of this legislation is to prevent construction delays caused by local municipalities and counties.

3.3.4 Incentive Payments for High-Voltage Transmission Construction

Other changes to the statutes included a revision to Wis. Stat. § 196.491(3g) regarding the payment of money to communities through which high-voltage transmission lines (345 kV or greater) will be constructed through. As specified in Wis. Admin. Code ch. 46, utilities are required to pay an annual impact fee and a one-time environmental impact fee to the Department

of Administration (DOA). DOA then distributes the money to the local municipalities and counties through which the transmission line is built. The amounts received by the local governments are based on a percentage of the cost of construction and the percentage of line that passes through the county, village, town, or city.

The annual impact fee is 0.3 percent of the cost of the high-voltage transmission line. DOA distributes the correct portion of the fee to each town, village, and city that is eligible in proportion to the percentage of the line that would be constructed within the various municipal boundaries.

The one-time environmental impact fee is 5 percent of the cost of the high-voltage transmission line. DOA distributes 50 percent of the fee to the counties that are eligible and divides the remaining 50 percent between the affected towns, villages, and/or cities. The amount received by the various governments is in proportion to the percentage of line built within the various municipal boundaries.

For a large transmission line which may cost hundreds of millions of dollars to construct, payments to local communities can total tens of thousands of dollars annually.

4.0 Summary of Potential Environmental and Community Impacts

The state's 2 percent per year growth in electric demand translates into adding approximately 300 MW of capacity each year over the next 7 years. Additional capacity can be achieved by either constructing new power plants or importing electricity from out-of-state. Both of these solutions create environmental and community impacts. New generation also requires additional transmission connections and continued upgrades of and improvements to existing transmission lines. Factors that delay this continuing need for more electricity include greater efficiency of plant technologies, use of direct load control or interruptible load, energy conservation, and customer-sited renewable generation.

From base load to peakers, technological improvements have made new power plants more efficient so that more electricity is generated while emitted pollution remains at the same level or lower. Other methods that reduce energy consumption are utility programs and customer conservation.

The state requires a mix of generation technologies and fuels to provide reliable electricity at an acceptable cost. The majority of Wisconsin's power currently comes from fossil fuels, coal in particular. Coal-burning power plants produce the most environmental and community impacts. Over 95 percent of the pollution generated by power plants in the state is emitted by coal-burning plants. Pollutants emitted by coal-burning plants include carbon dioxide, nitrogen oxides, sulfur oxides, particulate matter, and mercury. Health impacts from coal-burning plants include lung damage, asthma bronchitis, and pneumonia. Consumption of fish with elevated mercury levels can cause damage to nervous systems, especially in children and fetuses. Environmental impacts include increased levels of haze, smog, global climate change, and acid rain. No current programs or technological advances in the near future will lessen Wisconsin's dependence on

coal. Currently, three new large coal units (1,745 MW) are under construction and before 2012, two more may be proposed.

Even though the number of coal-burning plants in the state is increasing, coal plants are become less polluting. This is due to tighter pollution regulations and newer coal plant technologies. Between now and 2012, the finalized Clean Air Mercury Rule will lower mercury emissions, revisions to National Ambient Air Quality Standards will most likely reduce particulate emissions, and the Clean Air Interstate Rule will lower nitrogen oxides and sulfur oxide emissions. Current trends predicted by the utilities themselves show that emission levels of regulated pollutants will be reduced even as the number of generating facilities increases. Regulations will most likely require the retirement of smaller, older, coal plants that produce a disproportionate amount of air pollution. With the exception of MG&E, no other utility has specifically discussed retirement of older coal plants and how their generating capacity will be replaced. The uncertainty about the specifics of these air emission regulations is causing the utilities to delay in finalizing appropriate plans. This will push back emission reductions and potentially cause Wisconsin to not meet some of these new regulatory deadlines.

The data submitted by the utilities show that unregulated pollutants such as carbon dioxide are expected to increase. There appears to be no substantive regulations on the horizon regarding control of greenhouse gases. And while the scientific evidence indicating global warming has become quite conclusive, solutions have not been forthcoming. The new coal technology, IGCC is being studied by both federal and state entities. The EPAct provides money and programs to help develop this technology for commercial applications. The advantage of this type of power plant is its ability to capture various emissions for reuse or disposal, including carbon dioxide. However, at this time, proper management of the captured carbon dioxide is still being debated. Despite the potential increase in capital cost, IGCC technology holds promise.

The utility-submitted data also shows a significant increase in the amount of ash that may be unusable and need to be disposed at landfills. This is a large waste stream that should not be overshadowed by discussions of emission control. Again IGCC technology holds out the advantage that its ash would be reliably reusable in contrast to SCPC technology. The reusability of ash from SCPC units is dependent upon the specific pollution control devices and the type of coal chosen.

While not replacing the state's need for additional power plants, the development of more renewable sources of electricity may slow down or delay the state's need for more base-load generation. There is a massive push for construction of wind farms, the only large scale viable source of renewable electricity. Both state and federal legislation has made this an attractive renewable option. However large-scale wind power in Wisconsin can have cumulative impacts to communities and the environment. Due to the lack of high quality wind resources, many of these wind farms will be concentrated along the Niagara Escarpment. Recent bird and bat mortality studies in the Midwest seem to indicate that individual wind turbines may not have significant impacts to populations of species not at-risk. However, studies have centered on representative samples of turbines within larger wind farms. Currently more than 400 wind turbines are proposed for the Niagara Escarpment. If the tax credit continues to make wind power feasible, it is estimated that perhaps as much as 2,000 MW or more than 850 wind turbines may be needed for the utilities to meet the requirements of Act 141. If most are built

along the Niagara Escarpment, the long-term effect of these turbines may have negative impacts on some bird and bat species. No studies have looked at the cumulative effect of so much wind development in the Niagara Escarpment region. In addition, there would be the aesthetic impact of such a massive change to the state's regional landscape.

The state is still in the midst of a transmission construction phase. In particular, ATC proposes more than $1.6 billion of transmission construction projects that will require approximately 200 miles of new ROW. ATC's proposed construction program highlights the need for public involvement in all aspects of the transmission review process. The more difficult lines to site may involve a choice of constructing through more populated residential areas or through areas of valued natural resources. Solutions to upcoming transmission problems may not contain a neutral option that all can reasonably agree on. The continuing use of pre-application public meetings and public outreach should facilitate the process of winnowing down the potential routes to the alternative routes in the PSC application.

Mitigation of community impacts has been legislated by the state through substantial increases in shared revenue programs and high voltage payments. It is an acknowledgement that these communities will have impacts and deserve some form of compensation. It also attempts to minimize power plant impacts by providing incentives for the use of brownfield sites. Act 89 attempts to reduce impacts from new transmission lines by promoting corridor-sharing. These state laws reflect the continued search for means to reduce potential impacts and compensate those that are impacted.

Finally, a number of new laws attempt to streamline the review process of new electric construction projects. This includes portions of Wisconsin Act 89 that requires a high level of coordination between DNR and PSC during the pre-application phase and links the issuance of DNR permits to 30 days after the issuance of a Commission order. Wisconsin Act 24 requires that municipal and county lands that will be crossed by approved high-voltage transmission lines must be conveyed to the electric utility at fair market value. This was passed to prevent local governments from delaying the construction of an approved line. Portions of the EPAct also address potential delays caused by interstate transmission lines, creating the federal-designated "national interest transmission corridors". It grants siting authority to FERC to issue permits for transmission projects in these national interest corridors under some circumstances. While these laws were all enacted to simplify the review process and prevent delays in construction, it is important to note that a thorough vetting of project options is necessary to determine the range of potential impacts. And even though building a consensus may not always be possible, the value of public involvement should not be overlooked in a rush to construction.

Analyzing the environmental impacts of generation and transmission is complex due to the many local, state, and federal influences. Many environmental rules are currently in a state of flux while the state's electric demand continues to grow. The only guaranteed method of reducing environmental and community impacts is to reduce or at least slow down the growth in electrical demand through conservation and increased energy efficiency, even though this may raise the cost of electricity. The Public Service Commission continues to monitor new developments in the energy field in an effort to balance the trade-offs between need, cost, and impacts.

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APPENDIX A

Table A-1: High-Voltage Transmission Lines 69 kV or Greater and Upgrades/Rebuilds of Lines Greater Than 100 kV Construction Expected to Begin Prior to December 31, 2012

Endpoint 1 Substation	Endpoint 2 Substation	Midpoint Connection (if any)	Operating Voltage (kV)	Est. Cost (Millions)	Expected Construction Start Date	Expected In-Service Date	New Row Required	Substation Modifications	PSCW Status and Docket Number
ATC Transmission Lines									
Arrowhead	Weston		345	$429.0	under construction	Jun-08	Yes	Yes	Approved 05-CE-113
Hiawatha	Indian Lake		138	$49.6	under construction	Jun-09	No	Yes	Michigan Project
Columbia	North Madison		345	$30.6	under construction	Jun-06	No	Yes	Approved 137-CE-119
Morgan	Stiles	Falls, Pioneer	138	$9.0	Nov-04	Dec-05	No	No	Approved 137-CE-130
Plains	Stiles	Amberg	138	$98.5	Dec-04	Jun-06	No	No	Approved 137-CE-124
Martin Road	South Fond du Lac/ Ohmstead		138	$1.6	Jul-05	Jun-06	No	Yes	
North Beaver Dam	East Beaver Dam		138	$2.3	Jan-06	Jun-06	Yes	Yes	137-CE-131
Turtle	Bristol		69	$5.9	Jan-06	Jun-06	No	Yes	Approved 137-CE-128
Southwest Delavan	Bristol		69	$7.7	Apr-06	Jun-07	Yes	Yes	137-CE-136
Sycamore	Sprecher	Reiner	138	$5.9	Apr-06	Mar-07	No	Yes	Approved as part of 137-CE-120
Sprecher	Femrite		138	$22.0	May-06	Feb-07	Yes	Yes	Approved 137-CE-120
Cranberry	Conover		115	$17.1	Oct-06	Dec-09	Yes	Yes	137-CE-125
Jefferson	Stony Brook	Lake Mills	138	$21.9	Oct-06	Jun-07	Yes	Yes	137-CE-121
Kegonsa	Femrite	McFarland	138	$3.4	Oct-06	Feb-07	No	Yes	
Plymouth #4	Forest Junction/ Howards Grove		138	$2.5	Nov-06	May-07	Yes	Yes	
Venus	Metonga		115	$8.7	Dec-06	Jun-07	No	Yes	137-CE-126

Gardner Park	Central Wisconsin		345	$97.2	Jan-07	Jan-09	Yes	New Switching Station	137-CE-122
Canal	Dunn Road		138	$6.4	Feb-07	Jun-08	No	Yes	137-CE-140
West Darien	Southwest Delavan		69	$5.8	Apr-07	Jun-06	Yes	Yes	Approved 137-CE-117
Hiawatha	Mackinac (Straits)	Pine River	138	$73.2	May-07	Jul-09	No	Yes	Michigan Project
Gardner Park	Hilltop		115	$7.3	Jun-07	Dec-07	No	Yes	137-CE-135
Rock River	Elkhorn	Bristol	138	$5.1	Aug-07	Jun-08	Yes	Yes	
Rockdale	West Middleton		345	$61.0	Sep-07	Jun-11	Yes	Yes	
Morgan	Werner West		345	$117.9	Oct-07	Dec-09	Yes	No	137-CE-123
Conover	Plains		138	$99.3	Jan-08	Aug-08	No	Yes	137-CE-125
North Madison	Waunakee		138	$11.1	Jan-08	Jun-08	Yes	Yes	137-CE-139
Pulliam	New Suamico		138	$12.9	Jan-08	Jun-08	No	Yes	
Rubicon	Horicon	Hustisford	138	$16.0	Jan-08	Jun-08	Yes	Yes	137-CE-138
Montrose	Oak Ridge	Sun Valley	138	$6.5	Apr-08	Oct-08	Yes	Yes	
Hillman	Eden		138	$20.4	Aug-08	Jun-10	No	Yes	
Waunakee	Blount		138	$20.0	Oct-09	Jun-10	No	Yes	
Salem*	West Middleton	Spring Green	345/138	$297.2	Jan-11	Jun-13	Yes	Yes	
West Middleton	North Madison		345	$46.7	Jul-12	Jun-14	Yes	No	
NSPW Transmission Lines									
Border	Chisago County	St. Croix Falls	161	$15.2	Jul-05	Dec-05	No	Yes	
Dairyland Power Cooperative Transmission Lines									
Apple River	Chisago, MN	Lawrence Creek, MN	161/115	$11.6	Jul-08	Dec-10	No	Yes	Approved 1515-CE-102 4220-CE-155

*** This is a representative ATC Access Project. ATC has not determined which Access Project would like be filed.**

Table A-2: Proposed High-Voltage Transmission Line Projects Involving New Rights-of-Way Excluding Projects That Have Already Filed CPCN Applications with the PSC

Project	Voltage (kV)	New ROW Length (mi)	Screening Area[1] (sq mi)	Corridor Sharing Opportunities	Public Lands	Sensitive Resources	Cultural Resources[2]	Miscellaneous
Cranberry-Conover	115	11	74	State highways 32/45, 17, county highways, local roads, existing transmission and distribution lines, and railroad corridors	Chequamegon/Nicolet National Forest, Northern Highland - American Legion State Forest, Eagle Lake Park	Numerous lakes, streams, wetlands, and forested lands	High potential for historic and cultural resources	Eagle River Union Airport
Plymouth #4 - Forest Junction/ Howards Grove	138	1.2	2.5	State highways 23 and 57	None	Sheboygan River, Mullet River, Otter Creek, scattered wetlands, some forested lands	None	
Rockdale-West Middleton	345	28	290	New ROW will be required. State and county roads and existing transmission ROWs	Numerous city, county, and state parks including Indian Lake, LaFollette, and Festbe County Parks, Governor Nelson, and Lake Kegonsa State Parks, portions of the Glacial Drumlin State Trail, and several state fishery and wildlife areas	Bean Lake, Red Cedar Lake, and the Hook Lake/Grass Lake state natural areas, and much of the Yahara River drainage basin	The Koshkonong Norwegian Settlement, Bernard-Hoover Boar House, Robert M. LaFollyette House, Gilmore House, Olin House, the State Capital, several effigy mound sites, numerous museums, and the Langdon Street, Sherman Avenue, Third Lake Ridge, and Universi	
North Madison-Waunakee	138	5	47	State Highway 113 and other county highways, and local roads	None	Sixmile Creek, Empire Prairie State Natural Area, and various tributaries, isolated wetlands and woodlots	None	
Rubicon-Hustisford	138	5	45	State highways 60 and 67, county highways EE and N	None	Lake Sinissippi, Neosho Millpond, Rubicon River, Hepp Creek, and scattered wetlands and woodlots	None	
Montrose-Sun Valley-Oak Ridge	138	9	63	County and local roads, and a recreational trail	Nevin Hatchery, Brooklyn Wildlife Area, and a WDNR recreational trail are located within the screening area.	The Sugar River and associated wetlands, Story Creek, and other unnamed streams and wetlands	Architectural and historic sites	Moderate probability of encountering endangered resources.
Salem-Spring Green-West Middleton	345	114	2480	Numerous highways and local roads, existing transmission ROWs, and railroad corridors	Nelson Dewey State Park, Governor Dodge State Park, Tower Hill State Park, Bluemounds State Park, Blackhawk Lake Recreational Area, Turkey River Mounds State Park (IA), White Pine Hollow State Forest Preserve (IA), Lower Wisconsin State Riverway, numero	Upper Mississippi River National Wildlife and Fish Refuge, Lower Wisconsin State Riverway, numerous Wisconsin State Natural Areas, several State Preserves and recreational areas, the Mississippi and Wisconsin Rivers and their tributaries, and various othe	High potential for encountering cultural and historic resources	

Project	Voltage (kV)	New ROW Length (mi)	Screening Area[1] (sq mi)	Corridor Sharing Opportunities	Public Lands	Sensitive Resources	Cultural Resources[2]	Miscellaneous
West Middleton-North Madison	345	20	42	State highways 12, 14, 113, and 19, county highways and electrical distribution ROWs	Lodi Marsh wildlife area, county and local parks.	Pheasant Branch, Black Earth Creek, Halfway Prairie Creek, Sixmile Creek, tributaries to the Yahara River, Brandenburg Lake, Lodi Marsh State Natural Area.	None	Morey Airport

1 - Screening Area Width is defined as follows:
For lines 0 to 5 miles long, the screening area width equal length of segment;
For lines 5 to 15 miles long, the screening area width equals 5 miles;
For lines greater than 15 miles, screening area width equals 30 percent of line length.

2 - Cultural Resources are those resources listed on the statewide cultural resource map.

Table A-3: Communities where transmission and/or power plant construction is anticipated

ATC Transmission Projects

Brown County
C GREEN BAY
V HOWARD
T SUAMICO

Chippewa County
T RUBY

Clark County
C ABBOTSFORD
T COLBY
T GREEN GROVE
T HIXON
T LONGWOOD

Columbia County
T ARLINGTON
T DEKORRA
T PACIFIC
V POYNETTE
T WEST POINT

Dane County
T ALBION
V BELLEVILLE
T BERRY
T BLACK EARTH
T BLOOMING GROVE
T BLUE MOUNDS
V BROOKLYN
T BURKE
T CHRISTIANA
T COTTAGE GROVE
V CROSS PLAINS
T DANE
T DEERFIELD
T DUNKIRK
T DUNN
C FITCHBURG
C MADISON
V MAPLE BLUFF
T MAZOMANIE
V McFARLAND
C MIDDLETON
C MONONA
T MONTROSE
V MOUNT HOREB
V OREGON
T PLEASANT SPRINGS
T PRIMROSE
V ROCKDALE
T ROXBURY
T RUTLAND
V SHOREWOOD HILLS
T SPRINGDALE

Dane County cont'd
T SPRINGFIELD
C STOUGHTON
T VERMONT
T VERONA
T VIENNA
V WAUNAKEE
T WESTPORT

Dodge County
T BEAVER DAM
C BEAVER DAM
T HUBBARD
T HUSTISFORD
V IRON RIDGE
V NEOSHO
T RUBICON

Door County
T SEVASTOPOL
C STURGEON BAY

Douglas County
T BENNETT
T GORDON
T HAWTHORNE
T OAKLAND
V OLIVER
T PARKLAND
T SOLON SPRINGS
T SUPERIOR
T WASCOTT

Florence County
T COMMONWEALTH
T FLORENCE

Fond du Lac County
C FOND du LAC

Forest County
T ALVIN
T CRANDON
T NASHVILLE

Grant County
T BEETOWN
T BLOOMINGTON
T CASSVILLE
T CASTLE ROCK
T CLIFTON
T ELLENBORO
T FENNIMORE
T GLEN HAVEN
T HARRISON
T HAZEL GREEN
T HICKORY GROVE
T JAMESTOWN

Grant County cont'd
C LANCASTER
T LIBERTY
T LIMA
T LITTLE GRANT
V LIVINGSTON
V MONTFORT
T MOUNT HOPE
T MOUNT IDA
T MUSCODA
T NORTH LANCASTER
T PARIS
T PATCH GROVE
T PLATTEVILLE
T POTOSI
T SOUTH LANCASTER
V TENNYSON
T WATERLOO
T WINGVILLE

Iowa County
T ARENA
V AVOCA
T BRIGHAM
T CLYDE
V COBB
T DODGEVILLE
T EDEN
T HIGHLAND
T LINDEN
T MIFFLIN
T MINERAL POINT
V REWEY
T RIDGEWAY
T WYOMING

Jefferson County
T AZTALAN
T JEFFERSON
T LAKE MILLS

Lafayette County
T BELMONT

Marathon County
T CASSEL
T ELDERON
T EMMET
T FRANKFORT
V HATLEY
T HULL
V KRONENWETTER
T MOSINEE
T NORRIE
T REID

Marathon County cont'd
T RIB MOUNTAIN
T RINGLE
V ROTHSCHILD
T STETTIN
C WAUSAU
V WESTON
T WIEN
Marinette County
T AMBERG
T BEAVER
T BEECHER
V CRIVITZ
T MIDDLE INLET
C NIAGARA
T PEMBINE
T POUND
T STEPHENSON
T WAUSAUKEE
Oconto County
T LENA
T MORGAN
T OCONTO
T OCONTO FALLS
T STILES
Oneida County
T MONICO
T SCHOEPKE
Outagamie County
V BEAR CREEK
T DEER CREEK
T MAPLE CREEK
C NEW LONDON
Richland County
T BUENA VISTA
T ITHACA
V LONE ROCK
T ORION
Rock County
T BELOIT
T BRADFORD
C EDGERTON
T FULTON
T LA PRAIRIE
T TURTLE
Rusk County
T FLAMBEAU
T GRANT
T MARSHALL
T MURRY
T THORNAPPLE
T WILLARD
Sauk County
T FRANKLIN
T HONEY CREEK
V PLAIN
Sauk County cont'd
T PRAIRIE DU SAC
V SAUK CITY
T SPRING GREEN
T SUMPTER
T TROY
Sawyer County
T BASS LAKE
T COUDERAY
T EDGEWATER
T METEOR
T SAND LAKE
T WEIRGOR
Shawano County
T ANGELICA
T BELLE PLAINE
V BONDUEL
T FAIRBANKS
T GREEN VALLEY
T HARTLAND
T HERMAN
T MORRIS
T PELLA
T RICHMOND
T SENECA
T WASHINGTON
T WAUKECHON
T WITTENBERG
Sheboygan County
T SHEBOYGAN FALLS
Taylor County
T AURORA
T FORD
V LUBLIN
T MAPLEHURST
T PERSHING
T ROOSEVELT
Vilas County
T CONOVER
C EAGLE RIVER
T LINCOLN
T PHELPS
Walworth County
T DARIEN
T DELAVAN
C ELKHORN
Washburn County
T FROG CREEK
T STINNETT
Waupaca County
C CLINTONVILLE
V EMBARRASS
T LARRABEE
T LEBANON
T MATTESON

NSP/Dairyland Transmission Projects

Polk County
C St. Croix Falls
T St. Croix Falls
T Oseolo
T Balsam Lake
T Garfield
T Lincoln
T Apple River

Generation Projects

Dane County
C Madison
Dodge County
T Lomira
T Leroy
Outagamie County
C Kaukauna
Fond du Lac County
T Byron
T Oakfield
T Calumet
T Marshfield
Kewaunee County
T Two Creeks
Manitowoc County
C Manitowoc
Marathon County
V Rothschild
V Kronenwetter
Milwaukee County
C Oak Creek
Ozaukee County
C Port Washington
Sheboygan County
T Sheboygan Falls